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Event-sequence Analysis of Appraisals and Coping during Trapshooting Performance

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Abstract

This study describes appraisal and coping patterns of trapshooters during competition, via post-performance retrospective verbal reports. Probabilities that an event (e.g., missed target) is followed by another event (e.g., negative appraisal) were calculated and state transitional diagrams were drawn. Event-sequences during critical and non-critical performance periods were compared. Negative appraisals were most likely before and after missed targets and hits with the second shot. Positive appraisals were most likely before problem-focused coping and after emotion-focused coping. These findings support the process view of coping by illustrating that athletes cope with a variety of situations via a complex set of appraisals.

Key words: competition, delayed retrospective reports, sport performance, verbal reports.

1 Event-sequence Analysis of Appraisals and Coping during Trapshooting Performance

2 Appraisals and coping are cognitive processes in which people engage during stressful
3 life situations. These processes are intertwined in a dynamic relationship that allows individuals
4 to continuously adjust to ever-changing contextual demands (Lazarus, 1999). Moreover,
5 appraisals and coping change with familiarity with the situation or the characteristics of the tasks
6 encountered, and thus differences within and between athletes are expected (Gaudreau & Blodin,
7 2002). The purpose of this study is to explore the dynamic nature of these cognitive processes in
8 skilled athletes as the demands faced during competition change in terms of criticality. Lazarus'
9 (1999) cognitive-motivational-relational (CMR) theory of emotions is used as a foundation for
10 the study.

11 Lazarus' (1999) CMR theory of emotion holds that emotions are mediated by an
12 individual's evaluation of the significance for well-being attributed to the person-environment
13 relationship (Lazarus, 2000). Lazarus referred to this personal significance as relational meaning.
14 The interaction between an individual's external and internal environments represents a
15 transaction (Nicholls & Polman, 2007). Through a set of cognitive evaluations, or appraisal
16 processes, people make judgments about the relevance of a transaction to one's well being. If the
17 person perceives that the transaction puts something of importance at stake, stress ensues, and an
18 emotion coherent with a given relational meaning arises. For example, if winning a competition
19 is an important goal that is linked with relevant consequences to an athlete's well-being, the
20 athlete engages in appraisal processes that bring about a related emotion. The emotion has a core
21 content that represents an individual's relational meaning for the transaction. Therefore, the
22 concept of relational meaning explains intra- and inter-individual differences in emotional life
23 (Lazarus, 2000).

1 According to CMR there are two types of appraisals: primary and secondary appraisals.

2 Primary appraisals consist of judgments in relation to the relevance of what is happening in the
3 transaction to one's values, goal commitments, beliefs about self and the world, and situational
4 intentions. When the transaction is perceived as a condition of stress, appraisals of threat (i.e., the
5 possibility of future damage occurring as a result of a given outcome from the transaction),
6 challenge (i.e., perceived when people feel excited or enthusiastic about the struggle to overcome
7 obstacles posed by the transaction), harm/loss (i.e., evaluation of damage that has already
8 occurred), or benefit (i.e., evaluation of personal gains that have already occurred) may develop.
9 Secondary appraisals refer to a cognitive-evaluative process that is focused on what can be done
10 about a stressful transaction. This type of appraisal refers to individuals' evaluations of factors
11 such as agency, future expectancies, and coping options. Secondary appraisals constitute the
12 cognitive foundations for coping, but not the coping itself. They represent individuals'
13 evaluations of their coping potential and what they can expect as the outcome of the transaction.
14 If a situation is perceived as imposing excessive demands on an individual's resources, it will
15 lead to threat; however, if an individual believes that he or she has developed sufficient skills to
16 deal with the situation, challenge may develop.

17 The concept of adaptational coping, according to the CMR, refers to an act aimed at
18 reframing the person-environment relationship. Coping refers to "constantly changing cognitive
19 and behavioral efforts to manage specific external and/or internal demands that are appraised as
20 taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141). Thus,
21 coping is an ongoing process that takes into account the "fit between what one does, the
22 requirements of the conditions being faced, and one's individual needs" (Lazarus, 1999, p. 80).

23 According to this framework, coping has two major functions: *problem-focused coping*, in which

1 “a person obtains information about what to do and mobilizes actions for the purpose of
2 changing the reality of the troubled person-environment relationship” (p. 114); and *emotion-*
3 *focused coping* that “aims at regulating the emotions tied to the stress... situation without
4 changing [it]” (p. 114). These coping functions are often interrelated and both represent elements
5 of the “total coping effort” (p. 123). A coping strategy may encompass both coping functions, as
6 each often facilitates the other at improving the distressed transaction. Even though Endler and
7 Parker (1990) stated that “if there is a consensus in the coping literature, it is the distinction
8 between problem-focused and emotion-focused coping” (p. 846), they suggested *avoidance-*
9 *coping* as a third coping dimension. This dimension was defined as an individual’s decision to
10 withdraw from a stressful task, or to engage in another activity. In addition, Endler and Parker
11 (1990) proposed the categories of *task-oriented* and *emotion-oriented* coping, which are
12 nonetheless equivalent to Lazarus and Folkman’s (1984) conceptualization of problem-focused
13 and emotion-focused coping, respectively. Endler and Parker’s categorization has also been
14 adopted in the sport literature (e.g., Kowalski & Crocker, 2001; Nicholls, Holt, Polman, &
15 James, 2005).

16 Achievement events are prone to ongoing changes in contextual demands and, therefore,
17 require constant use of adaptational processes (Folkman & Lazarus, 1985; Skinner & Brewer,
18 2004). For that reason, athletes utilize a variety of coping strategies when competing. Even
19 though specific sets of coping strategies appear to be associated with specific stressors, elite
20 athletes such as figure skaters (Gould, Finch, & Jackson, 1993) and Olympic wrestlers (Gould,
21 Eklund, & Jackson, 1993) have been shown to use a combination of emotion-focused and
22 problem-focused coping strategies. Also, regional-level golfers have been found to alternate
23 between different types of coping strategies across phases of a competition (Gaudreau, Lapierre,

1 & Blondin, 2001). Strategy use was moderated by performance-goal discrepancies (Gaudreau,
2 Blondin, & Lapierre, 2002).

3 The present study attempts to extend current understanding of appraisals and coping in
4 athletes by identifying how these processes change as the task demands change. In particular, the
5 aim is to identify what cognitive appraisals and coping strategies are employed in response to the
6 onset of highly demanding or “critical” periods of performance. The lack of an appropriate
7 methodology is a key barrier to validly tracking changes in appraisals and coping during
8 competition. To elaborate, coping in sport has been studied traditionally through the use of
9 questionnaires and interviews that prompt participants to generalize about the coping strategies
10 they used across a noteworthy period of time or an event of noteworthy duration (e.g., an entire
11 competition or competitive series such as the Olympics). There are two key problems with this
12 approach. First, reports elicited following prompts to generalize about cognitive strategies,
13 including those underlying coping strategies, have been shown to be dissimilar to reports
14 collected in relation to, and soon after a specific episode (Ericsson & Simon, 1993; Nisbett &
15 Wilson, 1977). For example, Smith, Leffingwell, and Ptacek (1999) found only a 25% overlap
16 between reports of coping by students preparing for an exam obtained using a 7-day
17 retrospective protocol and a daily retrospective protocol. It was argued that mental schemas for
18 what people believed to be their usual strategies, length of the event and amount of interaction
19 involved, self-enhancement biases, and affect-congruent memory effects might have confounded
20 the reports of coping elicited in relation to the longer time period (see also Ericsson & Simon,
21 1993; Nisbett & Wilson, 1977). The second problem with the use of prompts to generalize about
22 coping strategy use during an event is that they limit insight into how coping strategies change in
23 response to moment-to-moment changes in task demands and task performance.

A key recommendation for reducing the effects of both of these problems is to obtain verbal reports of coping as close to “real time” as possible. Only recently have researchers in sport domains begun to adopt such methods (Nicholls & Polman, 2008) but this study constitutes an attempt to extend these efforts. Specifically, the attempt is to explore athletes’ appraisals and coping *during* an on-going competitive event by using a retrospective recall method (Ericsson & Simon, 1993). This method minimizes “the time between the event and recall” (Nicholls & Polman, 2007, p. 16). Furthermore, the method employed affords exploration of relationships between appraisals and coping and changes in the perceived demands of competition and in actual performance.

Method

Participants

Participants represented a convenience sample comprising six males (ages ranged from 21 to 59 years old) registered within one of the four skill categories of the Federação Portuguesa de Tiro com Armas de Caça (Portuguese Shooting Federation; FPTAC): category 1, which corresponds to international level athletes; category 2, national level; and categories 3 and 4, regional level. Participants 1 and 2 had won international titles and belonged to category 1. Participants 3, 4 and 5 were in category 2, while participant 6 was in category 4. Competitive experience within the entire sample ranged from 7 to 29 years. Recruitment was undertaken via an advertisement posted on the official FPTAC website and through personal contact. Participants read and signed an informed consent form.

Task

Trapshooting competitions consist of attempting to hit a moving clay target using a loaded two-shot shotgun. Following a verbal launch command from the athlete, a target is

launched from a machine positioned 15 meters in front of the athlete's firing position. The machine randomly selects a target trajectory from a wide range of preprogrammed trajectories. Data for participants 1 and 4 were collected during one leg, and for participants 2, 3, and 5 during two legs of the 2005 Portuguese Trapshooting Championship. Each leg involved six sets of 25 targets. Data for participant 6 were collected during the 2005 Portuguese Trapshooting Cup, which involved eight sets of 25 targets.

Performance Measure

The performance measure was *target outcome*, which was coded either as *hit with the first shot* (H_1), *hit with the second shot* (H_2), or *miss* (M).

Elicitation of Verbal Reports of Thoughts and Feelings Experienced During Performance via a Delayed Retrospective Report (DDR) Method

Problems with methods relying on introspection, such as the tendency to explain, interpret, and generalize about one's thoughts (Nisbett & Wilson, 1977) led Ericsson and Simon (1993) to propose "think aloud" procedures that direct the participant to report only to attended information (i.e., information in working memory). While these concurrent verbal reports of thinking were recommended as producing the most valid reflection of the cognitions mediating performance, Ericsson and Simon (1993) also proposed an immediate retrospective procedure for when concurrent reporting is not feasible. In this procedure, participants are asked to report immediately after a task on the thoughts they experienced during the last 10 seconds of task performance. Recently, Eccles and his colleagues (Eccles, in press; Eccles, Ericsson et al., 2005; Eccles, Ward et al., 2005) have adapted this procedure in an attempt to increase the validity of verbal reports of thoughts recalled from older episodes. This *delayed retrospective report* (DRR) method involves developing a timeline of critical events within the target episode in order to

1 frame the recall process, redirecting the recall process to the first critical event in the timeline,
2 and asking participants to recall the thoughts and feelings that occurred next, and so on, until the
3 next event in the episode timeline.

4 Therefore, after each set of 25 targets, a DRR method was used to elicit verbal reports of
5 thoughts and feelings experienced during the set. The series of 25 targets comprising the set
6 served as a natural event timeline. Participants were first asked to describe key events related to
7 performance within this timeline. For example, a typical description was that “Performance was
8 poor from target 5 onwards”. Next, participants were directed to recall any thoughts and feelings
9 experienced during the timeline (i.e., the set). Participants were asked to: (a) only report those
10 thoughts and feelings they could distinctly recall having; (b) feel perfectly comfortable in
11 reporting nothing if they could not recall any thought or feeling, and (c) simply report the nature
12 of the memory, however disjointed it might sound, and thus avoid explaining or interpreting their
13 recall. They were first asked to think back to the first target in particular and to report any
14 thoughts and feelings they could recall having immediately before and after the first target. This
15 process was then repeated for the second target and every subsequent target so that a sequence of
16 thoughts and feelings experienced before and after each target within a set was elicited.
17 Participants’ reports were captured by tape recorder.

18 The recorded reports corresponding to each set undertaken by each participant were
19 transcribed verbatim to create a text document. The text in each “set” document was carefully
20 inspected in order to locate the position of each target attempt within the set by locating the last
21 reported thought/feeling before, and the first reported thought/feeling after a given target was
22 attempted. Once the position of a given target attempt had been located, the appropriate target
23 number and outcome were inserted into the text. For example, the text “After target 3, I

remember thinking that I must hit the next target with the first shot. I remember hitting target 4 cleanly and feeling yes, good shot, let's keep it running like this" became:

I remember thinking after target 3 "I must hit the next target with the first shot."

Target 4: H₁

I remember hitting target four cleanly and feeling "yes, good shot, let's keep it running like this."

Critical Performance Period Identification and Coding

The participant's description of key performance events was used to identify critical and non-critical performance periods within each set. *Critical performance periods* represented periods of a set in which performance was described by the participant as poor and/or

particularly stressful. For example, by stating that "performance was poor from target 5 onwards", the participant defined a critical period beginning at target 5 and ending at target 10.

Non-critical performance periods represented periods in which the participant described performance as optimal or non-problematic. Note that these periods represented subjective evaluations by the participant about his performance. For example, a hit with the second shot could be interpreted negatively by one participant (e.g., "a miss is about to come") but positively by another (e.g., "good correction"). Nevertheless, participants' evaluations were largely consistent with objective performance: 45% of the targets referred to during critical performance periods were misses whereas 21% of the targets referred to during non-critical performance periods were misses.

Appraisal and Coping Coding

Reported thoughts within each set document were coded into the following categories: (a) *negative appraisals* (NEGA), consisting of verbalizations related to threats (i.e., conveying the

possibility of future damage occurring as a result of an outcome; e.g. “I’ll probably miss a target soon”) or losses (i.e., the perception of damage that has already occurred; e.g., “I’ve messed up the competition); (b) *positive appraisals* (POSA), consisting of verbalizations related to challenge (i.e., conveying enthusiasm or excitement about the struggle to overcome obstacles; e.g., “I’ll hit everything now”) or benefits (i.e., the perception of gain that has already occurred; e.g., “everything is normal now, all is well”); (c) predominantly *problem-focused coping* (PFC), consisting of verbalizations indicating attempts to primarily manage or alter the problem causing the distress (e.g., “I must advance the shot to avoid that cloud,” “slow down shooting pace”); (d) predominantly *emotion-focused coping* (EFC), consisting of verbalizations indicating attempts to primarily regulate emotional responses to the problem (e.g., “I have to calm down,” “I’m sick of knowing you shouldn’t mark targets!”); (e) *withdrawal coping* (WTH), consisting of verbalizations indicating mental disengagement from the stressful situation (e.g., “I want to get out of here,” “I’d rather be on the beach!”); and (f) *other*, consisting of verbalizations that did not fit into the previous categories (e.g., “let’s go quickly to get to the end”). Because a coping strategy can have both problem- and emotion-related functions (Lazarus, 1999), a verbalization was coded based on an assessment of the predominant function.

The first author undertook the appraisal/coping coding for all participants’ data. To assess inter-rater reliability, an independent coder who was familiar with research on appraisal and coping and had been trained to apply the coding scheme coded one participant’s data. The data from this participant were selected because he had produced a particularly comprehensive set of verbalizations that indicated a wide range of appraisals and coping strategies. Inter-rater reliability was 93.7%. Cohen’s *kappa* was .91, indicating “almost perfect” agreement (Landis & Koch, 1977, p. 165).

Description of Event Sequences

The appraisal and coping coding process resulted in a data file for each set that comprised a temporal sequence of events where an event could be either: (a) a verbalization coded as a cognitive appraisal (i.e., negative or positive) or coping strategy (i.e., problem-focused coping, emotion-focused coping, or withdrawal); or (b) a target outcome (i.e., H₁, H₂, or M) (Bakeman & Gottman, 1997). An example of an event sequence is M→NEGA→EFC→PFC→H₁; that is, after a missed target, the athlete reported a negative appraisal-related statement, followed by an emotion-focused coping statement, followed by a problem-focused coping statement, followed by a target hit with the first shot.

Analysis of Event Sequences

Discussion Analysis Tool software (DAT; Jeong, 2003) was used to undertake event sequence analyses, in which the relationships between events are explored through the computation of transitional probabilities. A transitional probability is the probability with which a “target” event directly follows a “given” event (Bakeman & Gottman, 1997). A “given” or “initial” event is the first event to occur in a paired (temporal) sequence. A “target” event is the second event in the same paired (temporal) sequence. For example, considering the paired-event sequence M→NEGA (i.e., missed target followed by negative appraisal), the “given” event is the missed target and the “target” event is the negative appraisal. Within DAT, the observed transitional probabilities between events are also converted into state transitional diagrams that effectively illustrate, and thus facilitate identification of patterns of events within sequences. Each event category is represented by a node, which is linked to another node by directional arrows. These arrows represent the direction of the transitional probabilities between nodes, and

their density illustrates the strength of these probabilities (Jeong, 2004). Sequences can be identified by observing the directional arrows between nodes.

DAT also calculates a z -score for each pair of events to determine which transitional probabilities significantly deviate from the expected probabilities. In this calculation “the differences in relative and observed frequencies of both given and target events” (Jeong, 2003, p. 33) are considered. The following formula was used to compute the z -scores (Bakeman & Gottman, 1997):

$$Z = \frac{X_{GT} - M_{GT}}{[M_{GT} * (1 - P_G) * (1 - P_T)]^{0.5}},$$

where G = a given event, T = a target event, X_{GT} = a paired-event observed score, M_{GT} = a paired-event expected probability, P_G = the probability of G, and P_T = the probability of T. z -scores with an absolute value higher than 2.32 were considered to be significant at $p < .01$. This probability level was chosen to reduce the probability of committing type I errors.

Results

To identify transaction patterns between appraisals, coping strategies, and performance, two sets of analyses were undertaken. The first analysis involved an exploration of these relationships across all athletes. The second analysis involved an exploration of these relationships as a function of the criticality of the performance period (i.e., critical vs. non-critical). Only paired-events with marginal sums of at least five (Bakeman & Gottman, 1997) are highlighted and later discussed, but all paired-sequences were reported in the table for descriptive purposes.

Relationships patterns of appraisals, coping and performance: group analysis

Probabilities and absolute frequencies for pairs of given-target events are depicted in Table 1. In addition, significant differences between expected probabilities and observed

probabilities for each pair of events are also represented. State transitional diagrams for aggregated data are illustrated in Figure 1. Probabilities between paired events (nodes) are represented numerically and graphically (i.e., higher probabilities are represented by thicker arrows).

Insert Table 1 and Figure 1 about here

Appraisals and coping. Negative appraisals were followed by emotion-focused coping significantly less than expected (21%, $z = -2.36, p < .01$). Negative appraisals were rarely reported after problem-focused coping. Positive appraisals followed emotion-focused coping significantly more than expected (4%, $z = 2.36, p < .01$).

Appraisals and performance. Negative appraisals were followed by miss targets and hit with the second shot significantly more than expected (respectively, 20%, $z = 2.90, p < .01$, and 9%, $z = 2.99, p < .01$). Negative appraisals emerged significantly more than expected after hits with the second shot (39%, $z = 4.57, p < .01$).

Coping and performance. Both problem-focused coping and emotion-focused coping were significantly more likely than expected to be followed by a hit with the first shot (49%, $z = 5.15, p < .01$, and 39%, $z = 4.92, p < .01$, respectively). Emotion-focused coping was more frequent after a miss (63%, $z = 7.38, p < .01$) and after a hit with the first shot (60%, $z = 3.44, p < .01$). Finally, withdrawal was followed by hits with the first shot (83%, $z = 3.36, p < .01$) and followed missed targets (7%, $z = 3.29, p < .01$).

Analysis of critical versus non-critical performance periods

Transitional probabilities and frequency matrices for pairs of given-target events during critical and non-critical performance periods are presented in Table 2. State transitional diagrams

are illustrated in Figure 2a,b. Data for non-critical performance periods include participants 3 and 6 only because the remaining participants did not report sufficient number of thoughts to conduct sequence analyses.

Insert Table 2 and Figure 2 about here

Appraisals and coping. During non-critical periods, negative appraisals were followed by problem-focused coping significantly more than expected (67%, $z = 2.62$, $p < .01$). During critical periods, negative appraisals were followed by both emotion-focused (22%, $z = 1.88$, n.s.) and problem-focused coping (13%, $z = -0.51$, n.s.). During critical performance periods, positive appraisals were followed by problem-focused coping significantly more than expected (50%, $z = 2.49$, $p < .01$).

Appraisals and performance. During critical periods, after negative appraisals athletes were significantly more likely than expected to miss (20%, $z = 2.55$, $p < .01$) or hit with the second shot (9%, $z = 3.09$, $p < .01$). Missed targets tended to be followed by negative appraisals during critical periods but not during non-critical periods. Hits with the second shot were predominantly followed by negative appraisals in both performance periods (40%, $z = 3.90$, $p < .01$, for critical periods; 33%, $z = 4.40$, $p < .01$, for non-critical periods).

Coping and performance. Missed targets were followed by emotion-focused coping during both non-critical (100%, $z = 3.64$, $p < .01$) and critical periods (60%, $z = 6.80$, $p < .01$). Hits with the first shot were also followed by emotion-focused coping (73%, $z = 2.37$, $p < .01$) during non-critical periods. Hits with the first shot were more likely to follow problem-focused coping (50%, $z = 5.23$, $p < .01$) than emotion-focused coping (38%, $z = 4.21$, $p < .01$) during

critical periods. During non-critical periods, hits with the first shot were significantly more likely than expected to follow emotion-focused coping (46%, $z = 2.39$, $p < .01$). Withdrawal statements were not followed by missed targets but always followed missed targets (8%, $z = 3.07$, $p < .01$); this latter pattern was identified exclusively in critical performance periods.

Discussion

The purpose of this study was to identify athletes' thought processes, as they relate to efforts to cope with task demands, during on-going competitive events through the use of a retrospective recall method and event sequence analysis. The current findings support the notion that athletes utilize a variety of coping strategies during competition (e.g., Gaudreau & Blondin, 2004; Gaudreau et al., 2001; Gould, Eklund et al., 1993; Gould, Finch et al., 1993). A discussion follows concerning the circumstances under which cognitive appraisals and coping strategies were utilized during performance.

Group analysis

Negative appraisals were significantly less likely to occur after problem-focused coping and emotion-focused coping. These paired sequences are an indicator of coping efficacy in dealing with negative appraisals. In addition, positive appraisals were more likely after emotion-focused coping. These sequences may represent the interdependence of coping strategies in what Lazarus (1999) designated the "total coping effort" (p. 123). For example, athletes may use emotion-focused coping to reduce emotional experience during stressful transactions to manageable levels, which allows them to then focus on the problem. For example, after missing a target, one participant reported "I can still miss another [target] without messing the entire competition" followed by "maintain the grip on the gun." Reframing the seriousness of the situation allowed him to focus on the relevant task. On another occasion another athlete reported

1 thinking after a miss “this one is mine, my mistake” followed by “one target at a time.”
2 Accepting the responsibility for the miss allowed this athlete to maintain control over his
3 emotions and actively focus in the present.

4 After problem-focused coping, athletes were less likely to report more thoughts as these
5 were followed mostly by hits with the first shot. When focusing on problem solving, athletes
6 tend to experience higher degree of control over the transaction (Nicholls & Polman, 2007) and
7 increased self-efficacy to perform (Haney & Long, 1995) which has been associated with
8 improved performance in subsequent tasks. Accordingly, Gaudreau and Blodin (2003) further
9 demonstrated that athletes who have used mostly task-oriented coping have reported performing
10 better than those who also used distraction and disengagement coping strategies. Therefore, it is
11 possible that the use of problem-focused coping represents increased control over the situation
12 which in turn may create the conditions for performance to occur more automatically without
13 further processing of information (Bless, 2001).

14 In what pertains to performance, results have shown that negative appraisals followed
15 (e.g., “All is lost”), and were followed by (e.g., “If I miss this shot the competition is over”) hits
16 with the second shot and missed targets. Consistent with Haney and Long (1995) who found that
17 in free-throw and penalty kick contests, athletes’ performances in the first round influenced their
18 appraisals in the second round, athletes in the present study appraised negatively poor
19 performances, which, in turn, influenced their coping. Moreover, problem-focused coping and
20 emotion-focused coping were associated with higher probabilities of hitting with the first shot,
21 and emotion-focused coping was associated with lesser probability of hitting with the second
22 shot. These sequences represent an overall pattern of coping efficacy, but they also indicate that
23 when athletes failed to cope with negative appraisals poor performance was more likely to occur.

Emotion-focused coping was the most common coping strategy to deal with missed targets and hits with the first shot. These patterns are likely to represent different contents. For example, after missed targets athletes may use venting of emotions (e.g., “one more target to f*** up the competition”, “How could have I missed this shot?!”) or assume responsibility for the outcome (e.g., “You missed because of you”, “this one [miss] is yours”) while after a hit with the first shot, athletes may have engaged in self-reassurance (e.g., “keep going like this”, “no more problems”) and develop perceptions of control (e.g., “ok, all is under control”).

Coping was used more frequently to reduce negative appraisals and deal with poor performance. The likelihood of reporting negative appraisals after coping was low. Even though coping appears to have been efficient when used, the use of emotion-focused coping after negative appraisals was lower than expected. In addition, the probability of reporting positive appraisals after use emotion-focused coping increased which may represent athletes’ ability to reframe the meaning of the transaction in such a way that it allows them to develop positive expectations about their performance (e.g., “a score of 23 is not that bad” followed by “I can still get a good rank”). Nevertheless, these patterns seem to be dependent on stage of the competition (Gaudreau & Blondin, 2004); specifically, different patterns have emerged as a function of performance periods.

Critical versus non-critical performance periods

Different patterns of relationships between events emerged in different performance periods. During non-critical periods, athletes coped with negative appraisals exclusively with problem-focused coping (e.g., “I’m going to hit this target with difficulty” followed by “don’t let the target go up too much”), whereas during critical periods they utilized both emotion-focused (22%) and problem-focused coping (13%). It appears that, in non-critical periods, negative

appraisals did not preclude successful self-regulation (Lazarus, 2000). On the contrary, they might have had a motivational role (Jones, 1995; Jones & Swain, 1995) for the athlete to engage in problem-solving. In addition, misses were not followed by negative appraisals, but by emotion-focused coping, which reinforces the idea that coping efforts were effective during this period. During critical performance periods, reports of coping with negative appraisals were not higher than expected, which may indicate difficulty in managing the pressure induced by the transaction. In fact, probabilities of missing a target or hitting with the second shot were significantly higher than expected. It appears that athletes did not use coping in a consistent manner or failed to cope with the pressure.

During critical periods, positive appraisals were significantly more likely to be followed by problem-focused coping (50%), whereas during the non-critical periods, positive appraisals were more likely to be followed by emotion-focused coping (43%, n.s.). The sequence during critical periods may represent an increased need to process task-relevant information, while the sequence during non-critical periods may represent minimal information processing and attempt to maintain emotional control. Schwarz and Clore (1983) suggested that affective states could have an informational value about the nature of an individual's current psychological situation. When performance is going well, the associated positive emotional states indicate that the transaction is beneficial to one's well-being (Skinner & Brewer, 2004). Therefore, there is no need to change the characteristics of the transaction during the non-critical periods. During critical periods, performance difficulties might signal problematic circumstances that must be changed and requires more elaboration and attention to specific contextual information to solve the problem.

1 The type of emotion-focused coping used also depended on the criticality of a period.
2 The athletes appeared to accept responsibility and used the strategy distancing during non-critical
3 performance periods, but engaged in venting of emotions and self-blame during critical
4 performance periods. Withdrawal was evident when athletes could not achieve their goals, and it
5 was concomitant with reports of frustration and perceptions of lack of control (Gaudreau et al.,
6 2002; Hatzigeorgiadis & Biddle, 2001), which occurred exclusively after misses during critical
7 performance periods (e.g., “I want to get out of here”, “I’d rather be at the beach”).

8 In agreement with Lazarus’ (1999; 2000) model, more important than the actual
9 performance, the meaning attributed to a given performance is essential to the appraisal process.
10 In both periods, negative appraisals occurred after the use of the second shot, resulting in
11 uncertainty and ambiguity about the performance. For example, the need to use second shots to
12 hit targets was often interpreted negatively (e.g., “a miss must be coming up soon”), triggering
13 threat appraisals. However, during non-critical performance periods missed targets were not
14 perceived negatively as threats and were always followed by emotion-focused coping.

15 In both performance periods, the link from performance (i.e., missed targets and hits with
16 the second shot) to negative appraisals was stronger than from negative appraisals to
17 performance. Perceptions of threat can influence performance, but how one performs can trigger
18 perceptions of threat or loss. In addition, coping efforts varied according to period criticality,
19 which confirms Lazarus’ (2000) contention that behavior is intertwined in a complex dynamic
20 process dependent on contextual variables.

21 The present findings support the process view of coping by illustrating that athletes cope
22 with a variety of situations as a consequence of a complex set of appraisals. As Lazarus (1999)
23 stated “coping strategies change from one time to another as the encounter unfolds or from one

1 encounter to another” (p.120). First, coping followed mostly an appraisal process; however,
2 change of appraisals can also result from coping efforts as observed in the increased rate of
3 emotion-focused coping-positive appraisals sequence and simultaneous decreased rate of
4 emotional-focused coping-negative appraisals sequence. Second, coping was used more
5 frequently after negative appraisals, which is consistent with the notion that negative appraisals
6 and the associated negative emotional states have a stronger impact in the individual (Lazarus,
7 1999). Third, the dynamic nature of the appraisal and coping process was accentuated by the
8 variability of the appraisals-coping-performance sequencing. Both appraisals and coping
9 influenced performance; negative appraisals were more strongly associated with suboptimal
10 performance than optimal performance, while the opposite was observed for coping. Finally,
11 choice of coping strategies is often appraisal- and context-dependent (Bouffard & Crocker, 1992;
12 Crocker & Isaak, 1997; Gaudreau et al., 2002). During non-critical periods, negative appraisals
13 were dealt with problem-focused coping, but during critical periods problem-focused, emotion-
14 focused and withdrawal coping were used. Cognitive appraisals are also content-dependent as
15 missed targets during non-critical moments were never appraised negatively in contrast with
16 what was observed during the critical performance periods. That is, individuals can appraise and
17 cope differently with similar stressors in different stages of the stressful encounter (Lazarus,
18 1999).

19 These results also have implications for practitioners. First, the present study seems to
20 indicate that reducing negative appraisals may contribute more to improve performance than
21 increasing positive appraisals. Negative appraisals were strongly associated with increased
22 probability of poor performance, but positive appraisals were not particularly evident even when
23 athletes were performing optimally. Knowing that poor performance was more likely after

negative appraisals, increasing coping efforts is likely to decrease the occurrence of such sequence. Athletes should employ coping strategies to avoid approaching the ensuing target without addressing negative expectations or perceived loss. As time between shots is short (i.e., 30 to 50 seconds), athletes should develop appropriate between shot routines that emphasize consistent use of coping after negative appraisals. Athletes should learn to interpret negative appraisals (and associated negative emotions) as an indicator that something in the transaction needs to be changed and act accordingly, particularly when performance is suboptimal. Emotion-focused coping is equally effective particularly when little control over the transaction is perceived (Nicholls & Polman, 2007).

Second, reinterpretation of the meaning of hitting with the second shot is advantageous as it has been found to be appraised negatively. The second shot is a resource that shooters have at their disposal; therefore, its use can be practiced and successful second shots can interpreted as evidence of skill which is likely to increase self-efficacy and perceptions of control (Haney & Long, 1995).

Third, athletes should practice focusing on the controllable aspects of performance as problem-focused coping was followed by increased likelihood of hits with the first shot. In addition, when performing optimally it is likely that reduced processing of information is beneficial, which allows athletes to use heuristics to make decisions (Bless, 2001; Schwarz & Clore, 1983) and maintain focus on the here-and-now.

Three relevant issues for researchers are worthy of further comment. First, because threat and loss appraisals, and challenge and benefit appraisals underscore different meanings of the transaction, it would be useful to examine the dynamics of these appraisals separately. Second, a mutually exclusive coding procedure was used in this study in which a given strategy could be

1 coded only as emotion-focused or problem-focused. However, a single coping strategy can have
2 both emotion-focused and problem-focused functions, and these are often interrelated (Lazarus,
3 1999). Still, the predominant function of a given coping strategy was determined through careful
4 interpretation of the participant's performance data and the verbal reports of their thinking.
5 Third, the interpretation of statistical analysis is limited to paired-events with marginal sums of
6 at least five (Bakeman & Gottman, 1997). The verbal report method used in the present study is
7 intensive and thus constrained sample size, which is consistent with other studies that have
8 involved the use of the method to trace thought and emotional processes during actual events (cf.
9 Nichols & Polman, 2008). The result of the small sample size is that the absolute frequencies of
10 particular sequences are small and thus it is recommended that future studies of online cognitive
11 and emotional processes involve larger sample sizes so that patterns of sequential cognitive
12 processes can be more fully identified and described.

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